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Natnael Berhane Debru

Department of Physics, McGill University, Montréal, Canada

Education

McGill University, Montreal, Canada 2024-Present
Master of Science in Physics
Supervisor: Prof. Katelin Schutz

The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy 2023-2024
Postgraduate Diploma in High Energy, Cosmology and Astroparticle Physics

Khalifa University of Science and Technology, Abu Dhabi, U.A.E. 2019-2023
Bachelor of Science in Physics, Excellent with Highest Honor **GPA**: 3.98/4.0
Thesis: *Cylindrical Solutions to the Vacuum Einstein Field Equations*, advised by Dr. Davide Batic

Research and Work Experience

Senior Research Project, Khalifa University September 2022-May 2023
Investigated new cylindrical solutions to the vacuum Einstein field equations in various coordinate systems in collaboration with **Dr. Davide Batic**, resulting in a journal publication.

Undergraduate Researcher, Khalifa University September 2021-May 2023 (part time)
, June 2023-August 2023 (full time)
Worked under **Dr. Satyendra Thoudam** on a theoretical investigation of the origin and propagation of high-energy cosmic-ray electrons to explain the observed 1 TeV break in the spectrum.

Summer Student, CERN, Geneva, Switzerland Summer 2022
Employed as a summer student researcher within the CMS Collaboration supervised by **Dr. Maurizio Pierini** and **Dr. Nadezda Chernyavskaya** on *Source-Agnostic Gravitational-Wave Detection with Transformers* [report]

Research Intern, Visiting Undergraduate Research Program, New York University Abu Dhabi, U.A.E. Summer 2021
Conducted a study on *Imaging near-surface flows in the Sun using machine learning* supervised by **Dr. Chris Hanson**. [report]

Publications

N. B. Debru, S. Thoudam, *Cosmic-ray electron spectrum from supernova remnants: the origin of the TeV spectral break.* **In preparation**

D. Batic, **N. B. Debru**, M. Nowakowski, *Axisymmetric Solutions to Einstein Field Equations via Integral Transforms*, Heliyon 9 (2023) e19828. arXiv: 2309.10543.

Presentations

Source-Agnostic Gravitational-Wave Detection with Transformers. CERN Summer Student Sessions 2022, 3 August 2022, Geneva, Switzerland.
Delivered oral presentation to CERN researchers and summer students

Awards and Honors

2019-2023 President's List, Khalifa University
Highest academic honor for all semesters attended

2022 CERN Non-Member State Summer Student Programme
Selected to perform fully funded research at CERN for a period of 8 weeks

2021 Golden Key Undergraduate Achievement Award ($1000)
Recognized for excellence throughout undergraduate career by the Golden Key International Honor Society

2021 NYUAD Visiting Undergraduate Research Program
Accepted to the competitive leading undergraduate summer research program in the U.A.E.

2020 Golden Key International Honor Society Membership
Among top 15% of Khalifa University students conferred membership to the society

2018 Khalifa University President's Scholarship
Full scholarship for duration of undergraduate studies

Outreach and Extracurriculars

Khalifa University Physics Club
President Fall 2021-Spring 2023
Co-founder and Vice-President Fall 2020-Fall 2021

- Hosted research seminar series connecting faculty and students of the Department of Physics.
- Organized events for members centered on physics outreach and entertainment, such as a trip to an electron microscopy facility and a telescope observation night.

Peer Tutoring Volunteer, Khalifa University Spring 2020-Spring 2022

- Assisted students in various mathematics and physics courses (Linear Algebra, Differential Equations, Calculus, Introductory Physics, Computational and Mathematical Physics).

Lead Peer Mentoring Volunteer, Khalifa University Spring 2021

- Provided freshmen with advice on university life and shared personal experiences.

Astronomy Education and Outreach, Italian School of Asmara, Eritrea Spring 2016

- Developed a semester-long school astronomy project as an assistant coordinator that resulted in an astronomy education event and observation night for elementary school children.

Professional Skills

Programming Python (Numpy, Scipy, Matplotlib, Pandas), MATLAB, HPC with Slurm, Maple, LaTeX
Machine Learning Transformers and other Artificial Neural Networks with Scikit-learn, Tensorflow, Keras
Experimental Physics Simulink, NI LabVIEW
Languages Tigrinya (Native), English (Proficient), Italian (Proficient), French (Intermediate)